EDITORIAL ARTICLES.

DRAINAGE IN PELVIC-ABDOMINAL SURGERY.

Dr. Hunter Robb, in the Johns Hopkins Hospital Reports, Vol II, Nos. 3 and 4, describes the practice of Dr. H. A. Kelly, Chief of the Gynæcological Department of that hospital, in the matter of drainage after pelvic-abdominal operations. His article is concise, yet so definite and minute in its descriptions of essential details as to make it of special value as a guide to others whose work carries them into this region.

According to the author drainage is to be employed to meet the following conditions:

First, to provide a means of escape for the serous oozing, which follows the separation of broad adherent surfaces.

Second, to guard against septic peritonitis from retained pus from the tube, ovary, or other viscus.

Third, to remove the fluid in cases of persistent capillary hæmorrhage.

Fourth, to provide against secondary hæmorrhage in cases of hysterectomy, where the pedicle is dropped.

Fifth, to drain the peritoneal cavity, and starve out the disease in cases of chronic or tuberculous peritonitis.

Koeberlé's glass tubes, with trifling modifications, are still the best. These tubes are straight, of a length varying from 5 to 6 inches, and a diameter of 8, 10 and 12 mm., all lengths being made of these diameters.

Tubes curved at the end are also valuable in cases of oophorectomy for fibro-myoma of the uterus, where it is necessary to drain Douglass' pouch over the convex surface of the tumor.

Every tube should be perforated with 9-12 holes, 1 mm. in diameter, extending from the lower end, one-third the length of the tube. When the diameter of the holes is larger than 1 mm., the omentum and the small intestines are very apt to work into the lumen of the tube, forming a strangulated hernia giving rise to severe pain and vomiting with hæmorrhage and sloughing.

The tube should be so placed that it will drain the fluid accumulating in the most dependent portion of the pelvis. This is best accomplished by inserting the tube in Douglass' cul-de-sac, so that it lies just behind the uterus gently resting on the floor of the pelvis.

The upper portion of the tube rests in the abdominal incision, from an inch and a half to three inches above the symphysis pubis.

Capillary drainage through the glass tube, by wick, gauze or cotton, should be provided for.

One of these substances thoroughly sterilized, and carefully placed in the tube so as to drain from the bottom, will insure a steady capillary flow of fluid from the bottom of the pelvis to the outside.

A drain made of ordinary lamp wick is the most efficient; next to this stands gauze, twisted into rolls just large enough to enter the tube easily.

In some cases of widespread injury to the cellular tissue of the pelvis, it is impossible to check the bleeding, and drain satisfactorily by means of the glass tube alone. Under these circumstances it is often possible to stop the hæmorrhage and drain the pelvis by packing long strips of a 5% iodoform gauze, an inch in width, behind the uterus and laterally, bringing them out at the lower angle of the wound. Firmer pressure can be made, and drainage secured by folding or coiling the gauze as it is placed in the pelvis, in the form of a spring, bringing one end out through a drainage tube.

The pressure on the tube, and through this on the gauze packed in the pelvis, can be regulated by tightening the abdominal binder.

A pack introduced in this way can be removed with very little disturbance by slightly raising the tube and pulling the gauze out through the tube layer by layer.

There is thus no danger of drawing out intestines or omentum with the dressing.

The Care of the Tube.—Let the tube be carefully placed, and the capillary drainage be properly provided for in the manner described, and there will be a continuous flow from the peritoneal cavity to the outside; and the tube will not need cleansing as frequently as has been thought necessary by some.

It is useless to remove the dressings every hour or two, exposing the patient to the risk of a septic infection by repeatedly cleaning out the tube. If the tube is properly arranged it can safely be left to care for itself for a period of from twelve to twenty-four hours, when it becomes necessary to expose it to remove the overlying dressings saturated by the discharge.

In fifty cases thus drained, this point has been tested by allowing the tubes to go without dressing for 24 to 48 hours, and in no case was a single unfavorable symptom observed.

The importance of perfect cleanliness in dressing the tube is not usually sufficiently appreciated. Hands, instruments, and dressings employed must be as thoroughly aseptic as at the time of operation, to avoid the danger of introducing infection from without.

For the purpose of cleaning out the tube, a tube forceps will prove very valuable in facilitating rapid, clean work. Such a forceps, devised by Dr. Kelly, consists of two very slender tapering-handles, crossing like scissors, and terminating below in rat teeth, to hold the little ball of cotton carried down to the bottom of the tube.

The blades are held by a new lock; devised for the purpose, above the forceps.

A piece of sterilized cotton, sponge or gauze, small enough to pass easily down to the bottom of the tube, is grasped in the forceps, and gently guided down into the pelvis, and upon withdrawal brings up the secretions.

This pledget is thrown away, and a fresh one used until the tube is dry.

This is a better method than the use of a suction apparatus, which is not efficient, and is at once contaminated and unfit for further use.

It is necessary at each dressing after cleaning the tube to rotate it, at least three times. It will sometimes be found, especially with perforations of larger calibre, that pieces of omentum as large as a split pea have become firmly fixed in the holes in the tube, forming a veritable omental hernia. Sometimes all the holes on one side will thus be choked, If gentle rotation and traction fail to effect a release, the tube must be carefully lifted up far enough to permit of a ligature being passed on the outside of the tube, around each little hernial mass in turn; after tying the ligature the tube should be cut loose by delicate, long bladed scissors, or by a slender knife. If the intestine should be caught in this way, it must be released by traction and careful pressure from the inside of the tube, with a small piece of cotton or gauze, in the grasp of the tube forceps.

In handling the drainage tube, the first principle is asepsis with hands and instruments, and antiseptic dressings immediately in and about the tube.

The following three modes of dressing the tube are described at length, as under each an important series of bacteriological investigations was made relative to the septic or aseptic condition of the tube contents.

The first mode, with bichloride cotton (1–200), dry or moist, and *powdered iodoform and boric acid* (1–7).

The procedure was to remove all the secretion from the tube with the bichloride cotton, held in the tube forceps, and then to dust from three to five grains of the powder mixture into the tube; then to moisten with distilled water a piece of bichloride cotton a little smaller than the tube, and from an inch to an inch and a half longer; squeezing this fairly dry, and twisting it into a roll, it was carried to the bottom of the tube, either by inserting it like a pencil, or by pushing it with the tube forceps.

The external dressing was completed by taking a piece of the bichloride cotton about seven inches square, and making a hole in the centre of it, this was then laid over the tube and the bichloride cotton was piled up around it and over all until the whole surrounding area was well protected.

The second mode of dressing was with *bichloride cotton* (1–200). *and cheese cloth* sterilized and kept in alcohol, in strips from ¾ to 1 inch in width and from 5½ to 7 inches in length.

The tube was cleansed as described and dressed with one of these strips taken from the bottle, wrung out in hot, distilled water, and twisted into a long plug, which loosely filled the tube.

In some few cases, dressed in this manner, the powder mixture of iodoform and boric acid (1–7) was used.

Third mode. The dry *bichloride cotton* (1–200) was used alone, both for cleaning and plugging the tube.

Although the results of the bacteriological experiments have been practically the same, according as one or the other manner of dressing was adopted, the most reliance is to the placed on the combination of the first and second methods, *i. e.*, the use of the bichloride cotton and sterilized gauze with powdered iodoform and boric acid, the cotton for cleaning the tube, the powder to dust down the tube, and the gauze for the drain.

No case has ever exhibited either local or systemic toxic effect from the dressing, although it is possible that sufficient of the bichloride escapes from the dressing to inhibit the growth of any micro organisms, which might chance to be present in the neighborhood of the tube.

When and How to Deliver the Drainage Tube.—The decision as to how long the tube shall be left in the abdomen is difficult in some cases. The general rule must be that it is safer to drain too long than for too short a time.

It must be borne in mind that the tube is inserted for the purpose of drainage, and that its function is over, and it should be removed as soon as the flow of fluid is not more than enough to wet the plug in the tube. This point may be reached in from twelve to twenty-four hours or in some instances not until the fourth or fifth day. The early removal of a tube relieves the patient of discomfort and anxiety; it also allows the fresh tissues of the tube track to collapse, promoting immediate union, and diminishing the liability to ventral hernia at a later date.

If there is but a small flow of serum on the dressing about the tube, and the general condition of the patient is good the tube may be removed without fear, and the slight accumulation left to the care of the peritoneum. If on the other hand the pulse and temperature are of such a character as to occasion any anxiety, the pulse being 120 and the temperature over 100°, although the discharge is slight it is better not to remove the tube and close the wound, until all flow has ceased.

When the tube is removed and there is a slight purulent discharge we may keep the track open by inserting a piece of twisted gauze, which is changed once in twelve or twenty four hours, dusting in a few grains of the iodoform and boric powder at each dressing.

This allows the tube track to close up gradually, carrying off at the same time any noxious fluids which would otherwise tend to accumulate. Where there exists a free purulent discharge from the first the tube should not be removed until one or two weeks have passed, to prevent the formation of pockets of pus in the pelvis, with secondary infection.

Another method of removing the tube where the discharge is rapidly diminishing, and does not amount to more than a few drachms in twenty-four hours, is by rotating and raising it slightly at each dressing. Before final removal, the tube should be cleansed as thoroughly as possible and rotated, to be sure that the intestines are free, and then placing the thumb over the end and grasping the tube between the first and middle fingers, it is slowly and gently removed. As soon as it is out, the wound is dried and the provisional suture drawn up, closing the track of the tube in the abdominal wall. The provisional sutures are one or two sutures passed through both sides of the abdominal incision in the tube track, and left loose until the tube is removed, when they are drawn up, completely closing the wound.

In the opinion of the author the vast majority of abdominal cases are safer with the tube than without it. The bad results attributed to its use are usually due to carelessness of management. The care of the tube is the duty of the surgeon himself, or of some one equally conscientious, and as well instructed.

Report of Culture Experiments Made with the Drainage Tubes.— These experiments were made on thirty cases in three groups, consisting of ten cases in each group.

In the first group, five of the experiments were made by stab cultures in nutrient agar-agar, two tubes being employed for each dressing. In the remaining five cases of this group, six Esmarch tubes were used at each dressing. In making the cultures, three were taken from the secretion on the end of the plug, and three from the bottom of the drainage tube. The second and third tubes were dilutions from the original inoculations in the first tube.

The results were negative, save in one case, that of a large ovarian cystoma, which was firmly adherent to the anterior abdominal wall. The inoculations made from the secretions on the end of the drainage tube resulted in an abundant growth of *staphylococcus pyogenes aureus.* Microscopic examination of the secretions themselves revealed the presence of the ordinary pus cells. The subsequent dressings in this case gave negative results.

In the second group of inoculations, the materials used were the same as those in the second method of dressing the tube, as above described.

Esmarch tubes were used throughout this series, six for each dressing, three being taken from the secretion on the end of the plug, and three from the secretion in the bottom of the drainage tube, after removing the plug. Six of this group were controlled by microscopic examinations. The results were all negative.

In the third group, the materials were the same as those employed with the third method of dressing the tube. None of the experiments in this series were controlled by microscopic examination. The results were also negative.

From these results one might reasonably suppose that organisms were not present in the fluid. One point, however, must be borne in mind, that is the possibility of a certain amount of bichloride of mercury being dissolved out of the plug, and present, as such, in the secretions, from which the inoculations were made. In this case it is easy to see that the growth of organisms, which might have been present, would be inhibited by the bichloride taken up on the needle used in inoculating the tubes. As has been shown by recent experiments, the amount of bichloride necessary to prevent the growth of organisms which have already been exposed to its action is very much smaller than the amount necessary to inhibit the growth of the same organisms which have not been so exposed.

Only a small proportion of these culture experiments were controlled by a microscopic examination of the fluid. The results in those cases, in which it was resorted to, however, corresponded to those obtained in the culture tubes.

A similar line of experiment, according to the improved methods recently developed for the study of organisms which have been subjected to the action of antiseptics, more particularly the bichloride of mercury, has been begun; and the results will be reported in a coming fasciculus.

THE ESSENTIALS OF A GOOD OPERATING ROOM.

Dr. Lucas-Championniere, of the Hospital Saint Louis, of Paris, gives in the *Revue d'Hygiene*, of April, 1890, his views of the conditions which are essential to provide a proper operating room, where the requirements of antiseptic surgery may be thoroughly met.

As testimony that he can speak with authority on the subject, he points to his own record, achieved, apparently, in the most unfavorable surroundings—132 abdominal sections, with but 10 deaths, 237 other major operations, with no deaths. His work is carried on without suppuration. From his own experience—and he challenges any one to show a better record—he concludes that complicated paraphernalia and expensive equipments are not necessary for the doing of good work. What should be studied by the surgeon in planning his operative surroundings is simplicity of arrangement, such convenience of equipment that work shall be readily done and perfect supervision always possible. The ability to constantly watch and verify every operative step, he believes to have been the secret of his own success, handicapped, as he has been, by unfavorable surroundings. With this preface, the author passes to consider some

Antiseptic illusions. Under this head, he criticizes, first, those forms of apparatus for sterilizing water by boiling, which he has seen in various newly and expensively equipped operating theatres. Many surgeons think that boiling is not enough, but that the temperature should be carried up to 250° F. But in general an apparatus is provided which is self feeding; that is to say, every time water is drawn from it which has really boiled, there enters it water which has not boiled at all, and from that moment, if they do not wait for quite a time, the water contained in the apparatus is not sterilized at all. The only apparatus, then, which can be depended on for sure sterilization is a good kettle, which can be filled up only when its sterilized contents have been used out.

The efforts of certain surgeons to furnish for the operating room air which has been previously sterilized, are also characterized by the author as illusory. The dangers due to the entering volumes of air are absolutely insignificant compared to the dangers due to the presence in the room of living beings, assistants and spectators, who are continually projecting into the room a considerable number of microbes. If we cannot avoid the latter source of infection, it is useless to try to keep off the former, which are so insignificant. To be logical in this respect, surgeons must operate in solitude. Such a precaution, however, the author spurns as an avowal of powerlessness that he is unwilling to make. Good antiseptic surgery, he says, can be done everywhere, and in public.

In all modern operating rooms an elaborate system of drains is seen, both for the table and the floor. This system of drainage is very difficult to manage, and, in the opinion of the author, is of no value to those who know how to do antiseptic surgery. It has come into use from the practice of copious irrigations of wounds, a practice against which Championniere protests as irrational, and dangerous to the patients.

Against another dominating peculiarity of modern operating rooms he also inveighs, that is the covering the walls with glass under the pretext of providing a smooth non-absorbable surface. Such rooms, equipped at great expense, are often badly kept in order.

From these criticisms the author passes to a statement of the things which, in his view, are essential to the practice of good surgery.

The first prerequisite for an operating room is that it should be conveniently placed for the accommodation of the service. It should be as near as possible to the wards, and easily accessible from them. It is not a matter of indifference to patients, upon whom major operations have been done, if they have to be carried long distances afterward.

For the same reason the room should be on the same level with the wards. (This reason does not hold in hospitals, in which elevators practically make all floors on the same level. Ed) Then the transportation of patients is greatly facilitated; transfers, often hurtful, are avoided, and such a simplicity of apparatus can be maintained that there is but little chance of its getting out of order.

There is no advantage in having several operating rooms, one for women, another for men. The operative requirements for the two sexes are the same. The single operating room should be used for everything, and by strict surveillance should be kept in perfect order.

Although the room, if it is to accommodate many spectators, should be quite large, it ought not to be made unnecessarily large. The ability to heat it sufficiently must be kept in mind. It must, however, be large enough to permit the operating table to be moved about in every direction, besides giving room for other necessary furniture.

A steady, not brilliant, light is desirable. A north light is the most convenient. A western light is not bad for those who operate in the morning. Direct sunlight is objectionable. Electric lamps are desirable for night work, or when the daylight is not sufficient, and especially when a deep cavity is to be illuminated. The lighting of the room should be complete; there should be no dark corners.

The general arrangement of the room should be such as to make its cleansing easy and absolute. The effacing of all angles is useful, but not indispensable. The walls may be of various materials; were it not for its costliness, enamelled tiles would be preferred. But common plaster, painted, does well. Painted wood is easy to clean and is economical; it stands well the application of antiseptics; it is easier to repair than plaster, so that accidents to it do not cause so much anxiety.

For these reasons the author has chosen wooden walls for his operating room. As to the floor, though mosaic is pretty and easily washed, it, together with asphalt and tiling, requires copious washings, which have their inconveniences. The author thinks that an equally good result can be had with simpler means. A simple floor of fir wood is doubtless much less agreeable to the eye than the floorings that have been mentioned, but it answers all the requirements of the work; it is very cheap, and if it becomes worn, it is easily replaced. It is much more agreeable to the feet than mosaic or asphalt; however, it is quite as easy to keep clean. The cleansing can be done with less water. Its purification can always be assured by applying to it a 5% solution of chloride of zinc, a procedure constantly employed by the author at the Hospital Saint Louis, where the floor, of fir, already old and poorly cared for during years, presents especially bad conditions. Here he has prosecuted his work successfully, notwithstanding the want of conveniences has often compelled the operating room to be devoted to uses that should always be proscribed, and although the floor has been often inundated with infective material.

The general arrangement of the room should be such that there could be no possible current of air over the operating table; it is desirable, also, that the opening of the door may not chill the room. The operating room ought not to open upon a cold corridor; it ought to be possible for patients to be returned to the wards without exposing them to chilling.

The warming of the room is an important point. For this purpose the author prefers the porcelain stove, which is peculiar to France and Germany. While it does not contribute to ventilation, neither does it produce currents of air. Ventilation can be secured by opening the windows. He has also in his operating room a large porcelain enclosed heating oven for linen, which he values highly. It is heated by gas, and is surrounded by an air chamber so that the linen may not be burned.

The instruments should be kept in a case in the room. He cannot comprehend how, under pretext of promoting the purity of the room, they should be kept out. To remove them complicates the preparations for an operation, and makes difficult the desired surveillance over them. Also there should be kept in the room everything necessary for dressings. Championniere keeps them in metal boxes, or in glass jars placed simply on wooden slabs, covered with oil cloth, which are easily cleaned.

For washing purposes all the complicated appliances of the plumber's art are rejected, and simple basins, to be emptied into a well trapped sink, chosen. The sink should have its surfaces perfectly smooth, and should be made of porcelain, or similar substance. The same sink can be used for the reception of all fluid which is to be emptied. Two or three basins placed on a wooden table, covered with oil-cloth, constitute a sufficient apparatus.

The operating table should be simple, cheap, easy to clean, easy to replace. The patient, when upon it, ought to be comfortable, warm, and easily removed. The author has a wheeled table which serves both for an operating table, and for the transportation of the patient. It is of wood; with two large wheels at one end, while the legs at the other end rest solidly on the floor. To mobilize it, a simple mechanism causes to project a third wheel which can be moved in any direction. A hair mattress covers the table. The patient, placed on the table in the ward, is easily brought by a single man into the operating room. Here he is practically on an ordinary bed, except that he is more elevated. Hot blankets and sheets are freely used to create favorable surroundings for operating. This table is used for all operations, even laparotomies. All complicated mechanisms for elevating the table have been abandoned. No copious irrigations are used. The small quantity of liquid really required can be removed with a sponge.

For holding the instruments, a metallic table is used, into which are fitted four movable metal basins. These contain the solutions into which the instruments are plunged, and remain convenient to the surgeon's hand. It is moved about easily, and no second person to hand the instruments is required. Another and deeper basin, also supported on a framework, is used for holding a stronger antiseptic solution, in which the instruments are immersed for a time before being placed in the basins for the use of the surgeon. Upon a small table, covered with oil cloth, are placed two basins for the sponges. Upon another table is the spray apparatus. Around the room are two large wooden tables, covered with oil-cloth, for miscellaneous use. In addition to these things, the room contains a boiler for boiling water.

An indispensable annex to an operating room is a room for administering anæsthetics.

The author concludes by expressing the opinion that instead of lavishing so much money for constructions that will soon be out of fashion, it would be much better to use this money for improving the service, by employing more intelligent, diligent and accurate assistants, a progress in the service of an operating room that no architect could supply. He claims that the extraordinary luxurious and complicated arrangements, which are now so much in vogue, do not conform either to the theory or practice of antisepsis. They are useless and dangerous, and tend to produce a bad effect on medical pupils, who quickly imagine that surgery consists in this complex and mysterious apparatus. They become discouraged from so difficult a work, and attribute to their lack of resources the results of their ignorance. The luxury of the instructors entails either discouragement or undue assurance in the pupils.

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